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The upshots of COVID-19 quarantine over diet, social interaction and education

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ABSTRACT: This study aimed to determine the impact of COVID-19 lockdown on lifestyle changes, including eating habits, daily routine, behaviour, education and research amid the volunteers of the Council of Scientific and Industrial Research-Central Institute of Medicinal and Aromatic Plants, Lucknow, Uttar Pradesh, India. A well-organised questionnaire with demographic and anthropometric information, dietary information, education and research information, and daily routine habits before, during and after the lockdown was prepared in January-March 2021 for impact analysis. The questionnaire was distributed amongst 600 volunteers. Each section within the questionnaire was explained well for an appropriate response. The questionnaire was collected after 15 days. 150 volunteers responded to the questionnaire, ages ranging from 15-60 years, including 64 males and 86 females. More than 60% sensed a change in hunger and satiety sensations, and 50% gained weight. The Body Mass Index (BMI) of 88 volunteers was reduced with a compromised daily routine and social behaviour. Moreover, 50% of volunteers did not prefer the online education system. The experimental research activities were disrupted, and it took ~72 days to resume. This study concludes that during the lockdown, the lifestyle, eating habits, daily routine, behaviour, and education were compromised but not significantly and therefore, it reverted after the lockdown.

1. INTRODUCTION

Corona Virus Disease (COVID-19) emerged as a severe acute respiratory infection caused by SARS coronavirus 2 (SARS-CoV-2), which affected the entire world with a high mortality rate. On 30th January 2020, the WHO Emergency Committee declared it a global health emergency because of the rapid spread of infection and continuously growing cases. In India, as soon as the COVID-19 disease rapidly reached about 500 patients, the government ordered an initial nationwide lockdown for 21 days on the evening of 24th March 2020, limiting the movement of the total population as a precautionary measure to impede the spread of COVID-19 infection. It was further extended with restrictions till 30th June 2021, with limited services resumed phase-wise. During the lockdown, people were restricted from stepping out of their homes. Transport services, including road, rail and air, were suspended (except for transportation of essential goods, hospital, fire, police, and emergency services). This sudden lockdown exempted government and private services such as groceries, banks, ATMs, petrol pumps, educational institutions, industries and hospitality services (Singh et al., 2021; Soni, 2021). The lockdown caused sudden and radical changes

in the habits and lifestyles of the population, with a drastic reduction in some form of socialisation. Social distancing and quarantine intensely affected dietary habits and daily routines. Two significant influences were observed in individuals residing at home (performing digital education, smart working, and limiting outdoors and physical activity) and stockpiling food because of the restriction in purchasing foodstuff (Manjunath et al., 2021). The disruption of routine activities during the quarantine state resulted in a change in the lifestyle of the people mainly due to continuous hearing or reading stressful news about the spread of COVID-19 infection and case reports from media leading to unwanted anxiety (Ahmad & Murad, 2020). This constant anxiety modified the individual behaviour and routine habits either positively or negatively.

During the COVID-19 lockdown, people stayed at their homes, compromised a healthy regime and eating habits, and regular physical activities. The restricted access to everyday grocery shopping reduced the consumption of fresh foods such as fruit and vegetables. It increased the consumption of easy to get processed food items such as snacks and ready-to-eat cereals containing high salt, fats and sugars. Psychological and emotional conditions during the COVID-19 outbreak lead to stress, and palatable food items produce hedonic

Table 1

Participants' demographic and anthropometric information.

Age (Years)	Number of Volunteers
<20	7
21-25	42
26-30	72
31-35	9
36-40	3
41-45	1
46-50	6
51-55	3
56-60	4
Age not mentioned	3
Average Age	28.98
Gender	
Male, Female	64, 86
Height	5'4 feet or 146 cm
Average Weight	58.66
Body Mass Ratio	1416 1272 (n = 88)
Average BMR Low BMR Normal BMR High BMR	1694 (n = 42) 1908 (n = 8)

responses leading to overeating. In contrast, people staying away from their family, i.e. living alone or self-isolated, are more susceptible to emotional eating. These negative reinforcements tend to change physiological satiety and hunger signals, leading to overeating or eating restriction; both are considered harmful (Chang et al., 2021; Ismail et al., 2021).

Considering consequences of COVID-19 infection, an impact assessment of the lockdown on the volunteers of CSIR-CIMAP was performed. The survey analysis aimed to explore the effect of COVID-19 lockdown on lifestyle, particularly dietary habits, daily routine, social interaction, and online education. This might support understanding the people's awareness of their health during the pandemic and how to overcome the physiological and psychological changes during such emergencies.

2. SURVEY METHODOLOGY

The survey was conducted using a paper questionnaire. The data was collected from January-March 2021 by asking the volunteers about their experiences during the COVID-19 lockdown. The questionnaire was divided into four sections, particularly dietary habits, lifestyle habits, social interaction and education. The survey form was provided to the volunteers both in Hindi and English languages for their ease of understanding. Each question was thoroughly explained, and fifteen days were assigned to the volunteers to fill out the form. Out of 600 distribution, 150 volunteers (25%) responded with the desired information. A questionnaire format distributed to the volunteers is annexed as an Appendix.

3. RESULTS

In this survey, 150 volunteers responded, of which 64 were male and 86 were females belonging to different age groups (Table 1). The average age was ~29 years, height 5'4 feet or
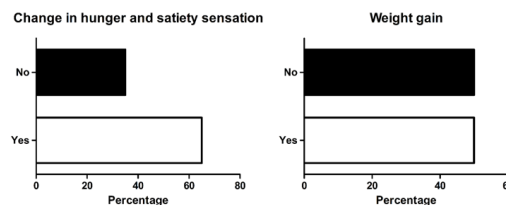

Figure 1. Graph depicting weight gain and change in hunger/satiety sensations among volunteers.
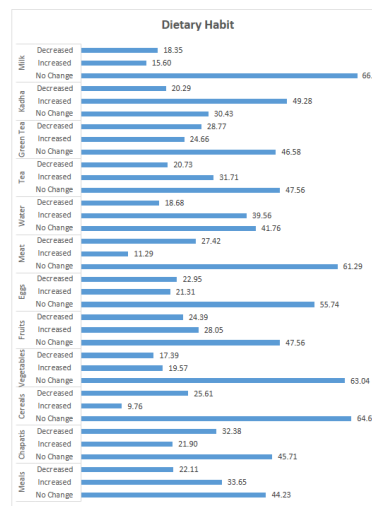

Figure 2. Food intake during COVID-19 lockdown. Percentage values were calculated for each category and type.

146 cm. We analysed body mass ratio (BMR) using the Harris-Benedict equation based on weight and height data. In India, 1600-1800 BMR is considered to be ideal for individuals. We found that after COVID-19 lockdown, the average BMR of our study group was 1416, which is far below average on further classification. It was found that 88 have low BMR averaging 1272, 42 have normal BMR averaging 1694 and 8 have high BMR averaging 1908. Previous studies have revealed that low BMR is crucial for developing obesity (Mullur et al., 2014; Rynders et al., 2018). COVID-19 lockdown of about four months was sufficient to cause changes in dietary habits and the possible development of obesity. On the one hand, an increased BMR is a pre-determining feature for bulimia nervosa and anorexia nervosa, whereas a decreased BMR is responsible for binge eating disorder.

Table 2
Percent change in food intake before, during and after COVID-19 lockdown.

| S.No	Food	Food intake percentage increased			Food intake percentage decreased		
		Before (%)	During (%)	After (%)	Before (%)	During (%)	After (%)
1.	Meals	29	42	29	40	27	33
2.	Chapatis	30	38	32	38	28	34
3.	Vegetables	25	50	25	50	20	30
4.	Fruits	21	45	34	54	17	29
5.	Egg	23	42	35	42	15	43
6.	Meat	29	41	30	47	23	30
7.	Water	29	38	33	47	24	29
8.	Tea	24	44	32	50	25	25
9.	Green Tea	46	35	19	11	25	25
10.	Ayurvedic decoction / Kadha	12	63	25	11	72	17
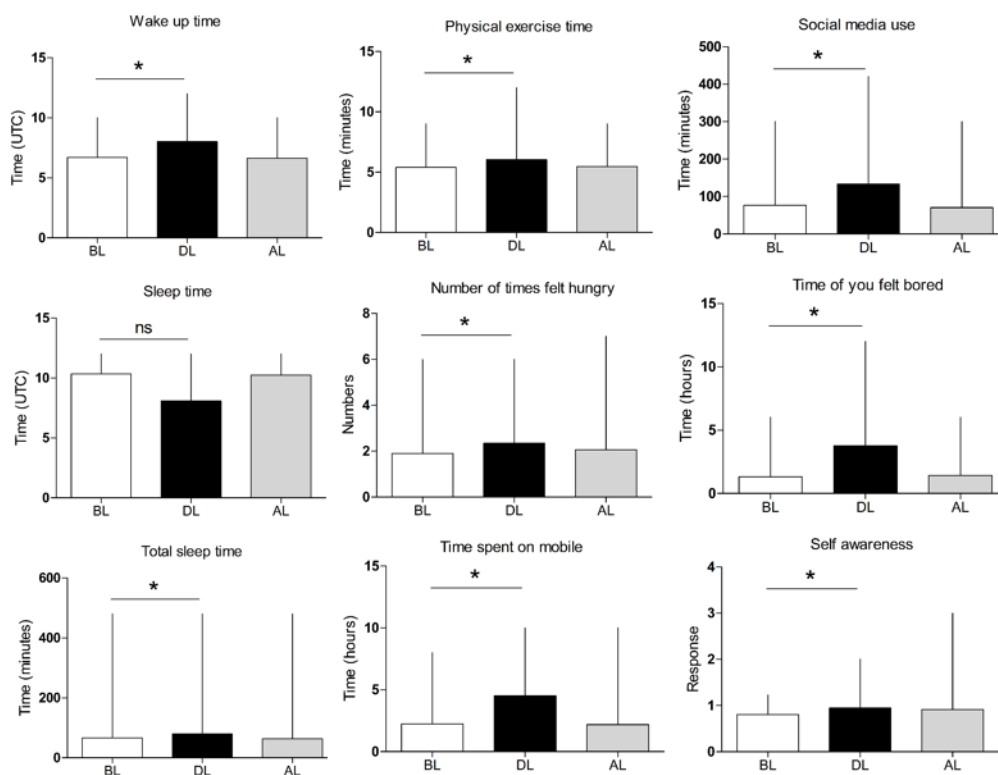
Figure 3. Daily routine before, during and after COVID-19 lockdown. The data are expressed as mean ± range. The statistical significance was evaluated by using paired two-tailed student's tests for comparing before and during lockdown response. *P <0.05* considered as significant.

Figure 4. Social interaction before, during and after COVID-19 lockdown**. The data are expressed as mean ± range. The statistical significance was evaluated by using paired two-tailed student's tests for comparing before and during lockdown response. *P < 0.05* considered as significant.
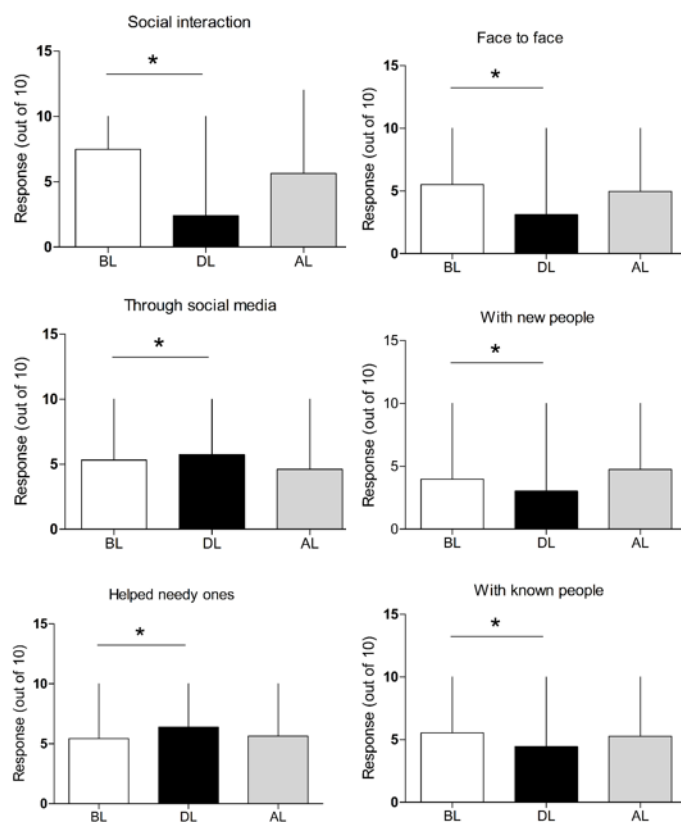
3.1. Dietary habit

Research studies suggest that dietary habits are drastically changed during eating disorders during COVID-19 lockdown (Rodgers et al., 2020). The analysed data indicate that the dietary routine of a minimum of 50% of volunteers was affected during the COVID-19 lockdown (Figure 1). Broadly, the obtained information was classified into two groups based on the increase or decrease in the eating behaviour of each volunteer (Figure 2). We also recorded dietary data before, during and after lockdown. This data suggests how much eating behaviour increased or decreased during lockdown compared to normal eating behaviour before lockdown. This data also gives information for the percent/number of people who followed the same eating behaviour even after the lockdown was lifted, suggesting the chance of getting either involved in an eating disorder or starting captivating a healthy diet. As mentioned above, in 33.65% of volunteers, the meal intake was found to be increased, wherein the meal intake was increased to 42% during the lockdown; however, after the lifting of lockdown, their eating behaviour reduced to 29% compared to before lockdown eating behaviour 29% (Table 2). It suggests that meal intake was reverted to its average level after lockdown.

Similarly, on the contrary side, among 22.11% of people whose meal intake was found to be decreased during the lockdown, their meal intake was compromised to 27%. Still, after lockdown, their eating was increased by 40% compared to before lockdown eating behaviour (i.e. 33%). Overall, it was observed that the eating behaviour of the volunteers increased after lockdown. Similarly, the increment of food intake (in per cent) (before lockdown/during lockdown/after lockdown) was analysed in Table 2. This data is supported by data where 50% observed weight gain during this period, and 65% sensed a change in hunger and satiety.

3.2. Daily routine

The COVID-19 lockdown is expected to compromise sleep/wake up timing, and duration of sleep, which may result in augmenting hunger sensations that ultimately could lead to the development of obesity. The data obtained from the volunteers suggests that the average morning wake-up time before the lockdown was 6:30 am, which was significantly increased by one hour (i.e. 7:30 am). In contrast, it reverted to its routine after lifting lockdown as offices and departments reopened. Conversely, the ideal time to go to bed at night was significantly reduced from 10:00 pm to 9:00 pm, followed by 10:30 pm

Table 3
Experience of volunteers with online education.

| 1. **Identity ?**		
(a)	Teacher	7
(b)	Parent	11
(c)	Student	114
2. **Preference for learning?**		
(a)	Face to face	70
(b)	Online	68
3. **Studies burden after COVID-19?**		
(a)	More	56
(b)	Less	18
(c)	As usual	57
4. **Did you enjoyed staying at home during lockdown?**		
(a)	Yes	92
(b)	No	43
5. **What would be the advantages of online education on face to face education in future?**		
(a)	Greater flexibility in learning process	48
(b)	Innovative and engaging ways of teaching	35
(c)	Improved teaching skills	15
(d)	Innovative ways of assessing students	20
(e)	No opinion	38
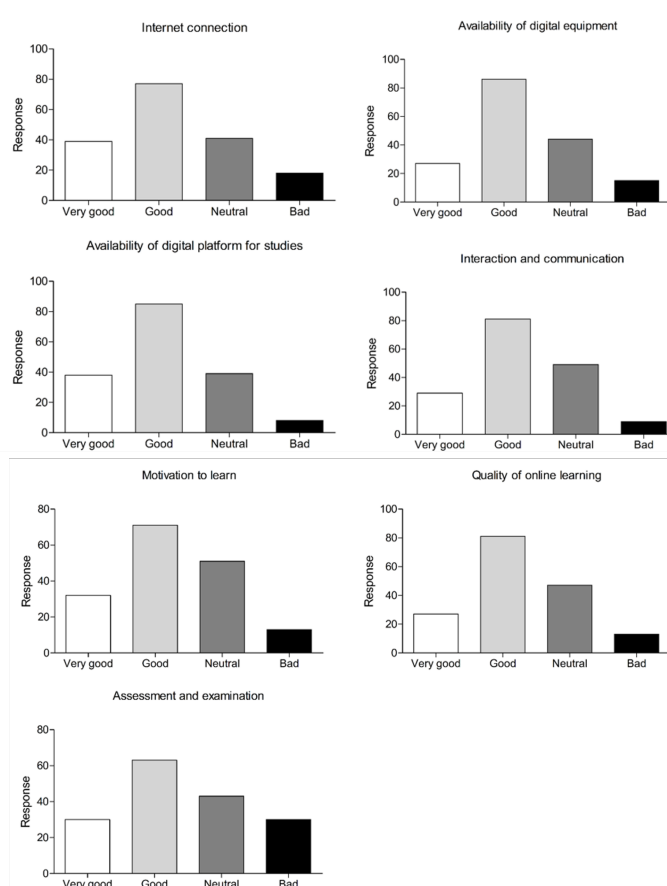
Figure 5. Experience, quality and availability of internet equipment.

timing after lockdown. Total sleep time was also considerably increased by one and half hours, supporting the above two data sets. The hunger sensations were also significantly increased to 4.5 times/day from 3 times/day; however, it recovered after the lockdown was over. This data also suggests that the boredom period was significantly increased by two times compared to the regular daily routine as an outcome of which people spent more time on mobiles and social media. Most surprisingly, physical exercise time was significantly increased, as depicted in Figure 3.

3.3. Social interaction

Previous studies have suggested that obesity and social isolation may lead to anxiety and depression-like symptoms (Mushtaq et al., 2014; Stefan et al., 2021). During COVID lockdown, social isolation was critical in initiating obesity and developing anxiety-like symptoms. In our questionnaire, different responses for social interaction have been noted before, during and after the lockdown. The answers provided by the volunteers were in the form of a rating between 0-10. The overall social interaction during lockdown was significantly reduced compared to before lockdown; however, it reverted to normal after the lockdown was over. Specifically, with known people, the interaction of the volunteers was found to be significantly reduced during the lockdown and continued after the lockdown. It was also observed that face to face interaction and interaction with new people was also reduced

during the lockdown, which reverted back slowly after the lockdown. In contrast, the interaction through the use of social media applications increased during the lockdown. Interestingly, during the lockdown, people significantly became more conscious of helping the poor and needy compared to before the lockdown period, as depicted in Figure 4.

3.4. Education and Research

COVID lockdown set a high impact on the students' academic and research activities as the schools/colleges/research institutes were closed. Hence students had the only option of attending online classes and give exams. The online version of the study was a surprising and new experience for both teachers and students. Our short survey outcome of teachers, parents, students (Table 4, Figure 5), PhD supervisors, and PhD students' answers are depicted in Table 4.

Sedentary behaviour developed during COVID-19 lockdown may also lead to modified sleeping habits. Research studies have reported that quality sleepers had higher adherence to the Mediterranean diet and lower BMI than poor sleepers (Muscogiuri et al., 2020). Sleeping disturbances and obesity are very closely related. The excess visceral adipose tissue releases pro-inflammatory cytokines responsible for alteration in the sleep-wake cycle (Hirotsu et al., 2015). Thus, obese individuals with pro-inflammatory cytokines could intensify

Table 4

Experience of research scholars during COVID lockdown.

1.	Identity?	
(a)	Supervisor	7
(b)	Student	83
2. Did your research work hampered during COVID lockdown?		
(a)	Yes	81
(b)	No	8
3. Did you come to the department unwillingly?		
(a)	Yes	16
(b)	No	69
4. Did you used COVID lockdown period efficiently?		
(a)	Yes	54
(b)	No	33
5. Did you go home during COVID lockdown?		
(a)	Yes	49
(b)	No	36
6. Did you write or submit research papers during COVID lockdown?		
(a)	Yes	25
(b)	No	62
7. How many days after lockdown did you start your work again? Mention number.		
(a)	Average number of days	72

the symptoms of COVID-19. Therefore, these subjects would possess a higher risk of COVID-19 severity compared to normal healthy individuals.

4. DISCUSSION

This survey cum study suggests that change in hunger, satiety sensations and weight gain was predominantly observed. The BMR is a key determining feature of the development of any eating disorder (Mullur et al., 2014). Increased metabolic rate is a pre-determining feature for bulimia nervosa and anorexia nervosa, whereas decreased metabolic rate advocate for binge eating disorder (Polito et al., 2000; Raymond et al., 2012). Moreover, the recent COVID-19 lockdown associated with social isolation stress has been reported to cause loneliness and compromise mental health (Banerjee & Rai, 2020; Fiorillo & Gorwood, 2020). Our data suggest that 88 volunteers observed lower BMR, which may lead to obesity or initiation of an eating disorder. Together with this, the meal intake variation was significantly observed (Table 2, Figure 2). Furthermore, the volunteers whose eating was compromised during the lockdown observed a sudden rise in food intake. These observations suggest that eating habits were compromised during the lockdown period, which may be due to a shortage of food supplies or a self-implicated decision.

Stress, anxiety and social isolation are considered triggering factors for the development of an eating disorder. Daily routine and social interaction gets compromised during the development of an eating disorder (Patel et al., 2016). The COVID-19 lockdown was the forced factor to disturb daily routine and for social isolation. Our data suggest that wake-up time and total sleep time were increased by 1-2 h, hunger sensations were increased by 1.5 times, and boredom time was increased twice. The volunteers started spending more time on social media using mobile phones.

Besides, people were motivated enough to take herbal decoctions (kadha) to enhance immunity to stay safe against COVID-19 infection, indicating self-esteem. Previous studies on stress-linked disorders suggest that the ability to self-care and motivated behaviours are compromised (Juth et al., 2008). Other studies also support the present study that social media could improve mental health during stress conditions (Bailey et al., 2020; Bekalu et al., 2019; Beyens et al., 2020). These results confirm that daily routine was affected during the COVID-19 lockdown, and such dull activities are generally observed in people associated with stress-related disorders.

During the lockdown, forced social isolation significantly reduced overall interaction amongst the volunteers; however, surprisingly, it increased the interaction through social media. Also, during the lockdown, increased social awareness for helping the people affected due to COVID-19 forced implications or the shortage of groceries/health-associated problems. This helping behaviour was carried out even after the lockdown, which revealed that the forced COVID-19 lockdown restrictions are not enough to trigger any stress-associated disorder because, under stress and depression conditions, the social interaction is supposed to get compromised.

The lockdown hindered the education system; as a remedy, teaching was provided online using the internet's digital platforms. Indian system was new to access online education because most of the learning is provided through the offline classroom. The lockdown was imposed just before the beginning of the final exams. The whole Indian education system adopted an online mode of academic activities to reduce the lockdown effect on education and safety, which was new to both teachers and students. The online classroom system requires high internet speed and digital equipment. We have observed that both teachers and students confirmed that they had decent availability of digital equipment and internet facilities. In contrast, online experience with assessment, examination, and study motivation was good enough.

5. CONCLUSION

This study concludes that during the lockdown, the lifestyle, eating habits, daily routine, behaviour, and education were compromised but not significantly and therefore, it reverted after the lockdown. Furthermore, it suggests that 4-months of restricted isolation was insufficient to develop any stress-associated problems. Also, the new online education system was motivating enough to teach and learn safely after sudden

restrictions.

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ETHICAL APPROVAL

Not applicable. This study does not include any preclinical/clinical data.

AUTHOR CONTRIBUTIONS

YH, KM - Research concept and design, YH, KM - Collection and/or assembly of data, SL - Data analysis and interpretation, YH, KM - Writing the article, AM - Critical revision of the article, AM - Final approval of the article.

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